Claims

1. Expandable tubular joint comprising, on the one hand, a first tubular element (EM) comprising a first portion (P1), provided with a male thread (FM), and a second portion (P2) extending said first portion and comprising i) a first outer surface (SE1), ii) a first annular lip (L1) having a first axial abutment surface (SB1) and a first inner surface (SI1) and delimited by said first outer surface (SE1) over a portion of the axial length thereof, and iii) a second abutment surface (SB2), and, on the other hand, a second tubular element (EF) comprising i) a female thread (FF), matching the male thread (FM) and screwed thereto, ii) a second annular lip (L2) having a third abutment surface (SB3) resting against said second abutment surface (SB2), a second outer surface (SE2), arranged to face said first inner surface (SI1), and a second inner surface (SI2), iii) a fourth axial abutment surface (SB4), and iv) a third inner surface (SI3) extending between said fourth axial abutment surface (SB4) and said female thread (FF) and defining with said second outer surface (SE2) and fourth abutment surface (SB4) an annular recess (LO) matching said first lip (L1), characterised in that said second (SB2) and third (SB3) abutment surfaces are conical surfaces having substantially identical angles of inclination relative to a plane transverse to a longitudinal direction (A), selected so as to allow said second abutment surface (SB2) to rest against said third abutment surface (SB3), generating a first radial and sealing interference contact of one of said first inner (SI1) and outer (SE1) surfaces of the first lip (L1) against said second outer surface (SE2) or said third inner surface (SI3) respectively, and such that, during a diametral expansion in the plastic deformation region subsequently carried out on the expandable tubular joint, said first outer surface (SE1) and said third inner surface (SI3) are forced locally to define a second sealing interference contact.

2. Joint according to claim 1, characterised in that said conical surfaces of the second (SB2) and third (SB3) abutment surfaces are convex and concave respectively, so as to generate said first radial and sealing interference contact of the first inner surface (SI1) against the second outer surface (SE2).

3. Joint according to claim 1, characterised in that said conical surfaces of the second (SB2) and third (SB3) abutment surfaces are concave and convex respectively, so as to generate said first radial and sealing interference contact of the first outer surface (SE1) against the third inner surface (SI3).

4. Joint according to any one of claims 1 to 3, characterised in that said inclinations are initially between approximately +5° and approximately +30°.

5. Joint according to any one of claims 1 to 4, characterised in that said first lip (L1) and said recess (LO) initially have shapes selected such that said first interference contact is not generated until said second abutment surface (SB2) rests on said third abutment surface (SB3).

6. Joint according to any one of claims 1 to 5, characterised in that said first abutment surface (SB1) is arranged to be forced during screwing to rest against said fourth abutment surface (SB4) so as to cause said first lip (L1) to be subjected to axial compression in the elastic deformation region.

7. Joint according to any one of claims 1 to 6, characterised in that the second outer surface (SE2) of said second lip (L2) initially has, in the region of its connection to said third abutment surface (SB3), an annular portion inclined relative to said longitudinal direction (A) by an angle of between approximately 8° and approximately 12°, and preferably equal to approximately 10°.

8. Joint according to any one of claims 1 to 7, characterised in that said first inner surface (SI1) of the first lip (L1) is initially inclined relative to said longitudinal direction (A) by an angle of between approximately 0.1° and approximately 15°.

9. Joint according to any one of claims 1 to 8, characterised in that the ratio between the extension (PR) of the second lip (L2) in the longitudinal direction (A) and the extension (H) of the recess in the transverse direction is between approximately 1 and approximately 3, and preferably between approximately 1.2 and approximately 1.6.

10. Joint according to any one of claims 1 to 9, characterised in that said male (FM) and female (FF) threads initially comprise threads provided with a carrier flank having a negative angle of between approximately –3° and approximately –15°.

11. Joint according to any one of claims 1 to 10, characterised in that said male (FM) and female (FF) threads initially comprise threads provided with a stabbing flank having a positive angle of between approximately +10° and approximately +30°.

12. Joint according to claim 11, characterised in that said male (FM) and female (FF) threads are arranged to have, after screwing and prior to expansion, an axial clearance between their stabbing flanks of between approximately 0.05 mm and approximately 0.3 mm.

13. Joint according to any one of claims 1 to 12, characterised in that said first tubular element (EM) initially has, in the region of its first outer surface (SE1) and before its first portion (P1), a conical chamfer defining a first local annular set-back (DC1) toward the interior.

14. Joint according to claim 13, characterised in that said chamfer has a slope which is substantially continuous relative to the longitudinal direction (A) and between approximately 8° and approximately 12°.

15. Joint according to any one of claims 1 to 14, characterised in that said first tubular element (EM) is provided with a second portion (P2) initially having a local annular added thickness (SA1) selected in the region of a fourth inner surface (SI4) extending said second abutment surface (SB2) in the direction of the first portion (P1), and said third inner surface (SI3) comprises, at a selected location, a groove (G1) suitable for being arranged after screwing substantially in the region of said local added thickness (SA1) and for defining in the region of the first outer surface (SE1), during the diametral expansion, an annular shoulder (EP) having at least a portion of the shape of said groove (G1) and being in sealing interference contact therewith.

16. Joint according to any one of claims 1 to 15, characterised in that said first tubular element (EM) initially has in the region of its first portion (P1), over its inner surface opposing said male thread (FM), a conical neck in which is defined a second local annular set-back (DC2).

17. Joint according to claim 16, characterised in that said neck initially grows substantially continuously at a slope relative to the longitudinal direction (A) of between approximately 2° and approximately 20°.

18. Joint according to any one of claims 15 to 17, characterised in that a groove (G1) comprising at least two curvilinear portions (C1, C2) is initially provided.

19. Joint according to claim 18, characterised in that said curvilinear portions (C1, C2) initially have substantially identical radii of curvature.

20. Joint according to claim 19, characterised in that said radius of curvature is initially between approximately 2 mm and approximately 60 mm.

21. Joint according to any one of claims 18 to 20, characterised in that the two curvilinear portions (C1, C2) are separated by a substantially cylindrical central portion (PC).

22. Joint according to any one of claims 18 to 21, characterised in that said groove (G1) initially has a radial depth (H'), the maximum value of which is selected such that the material section (G1) at the bottom of the groove is greater than the product of the smallest section of a common portion of the tubes (T1, T2) with which said first (EM) and second (EF) tubular elements are associated, and the efficiency of the joint under tension.

23. Joint according to any one of claims 1 to 22, characterised in that said male (FM) and female (FF) threads are selected from a group consisting of conical-type and cylindrical-type threads and are each formed over at least one tubular element portion (EM, EF).

24. Joint according to any one of claims 1 to 23, characterised in that said first tubular element (EM) is provided with a first rounded outer surface (SE1).

25. Joint according to any one of claims 1 to 24, characterised in that said second tubular element is associated with a substantially symmetrical female/female-type connection sleeve (M) and said first tubular element (EM) is associated with an end of a great length tube.

26. Joint according to claim 25, characterised in that said sleeve (M) comprises a central portion (PCM) extended on either side by two second tubular elements (EF1, EF2) and initially provided over an outer surface with an annular zone (G2) having a reduced thickness selected such that the initial thickness of said sleeve (M) in the region of this zone (G2) is greater than or equal to the product of the section of a common portion of the tubes (T1, T2), at the ends of which are formed said first tubular elements (EM), and the efficiency of the joint.

27. Joint according to claim 2 in combination with any one of claims 4 to 26, characterised in that said first (L1) and second (L2) lips initially have shapes selected such that said first abutment surface (SB1) rests on said fourth abutment surface (SB4) before said second abutment surface (SB2) is pressed onto said third abutment surface (SB3).

28. Joint according to claim 3 in combination with any one of claims 4 to 26, characterised in that said third inner surface (SI3) of the second tubular element (EF) initially has, in the region of its connection to said fourth abutment surface (SB4), a first sealing surface (DC3) generally having a selected angle of inclination relative to the longitudinal direction (A) and in that said first tubular element (EM) initially has, in the region of its first outer surface (SE1) and in the region of its connection to said first abutment surface (SB1), a second sealing surface (DC4) generally having a selected angle of inclination relative to the longitudinal direction (A) in such a way that, during screwing, said first (DC3) and second (DC4) sealing surfaces are radially tightened against one another, generating a third sealing interference contact.

29. Joint according to claim 28, characterised in that said first (DC3) and second (DC4) sealing surfaces are arranged in such a way that said first sealing interference contact is generated between them after said third sealing interference contact, so as to reinforce said third sealing interference contact.

30. Joint according to either claim 28 or claim 29, characterised in that said selected angles of the first (DC3) and second (DC4) sealing surfaces are initially between approximately +1° and approximately +30°.

31. Joint according to any one of claims 28 to 30, characterised in that at least one of said first (DC3) and second (DC4) sealing surfaces is a conical surface.

32. Joint according to any one of claims 28 to 31, characterised in that at least one of said first (DC3) and second (DC4) sealing surfaces is a rounded surface.

33. Joint according to claim 32, characterised in that said rounded surface comprises a toric-type portion.

34. Joint according to any one of claims 28 to 33, characterised in that said first sealing surface (DC3) is defined by a third local annular set-back toward the interior of said third inner surface (SI3).

35. Joint according to any one of claims 28 to 34, characterised in that said second sealing surface (DC4) is defined by a fourth local annular set-back toward the interior of said first outer surface (SE1).

36. Method for producing a sealed tubular expanded joint, characterised in that it consists, based on an expandable tubular joint according to any one of the preceding claims,

– in screwing said first (EM) and second (EF) tubular elements until said first lip (L1) is accommodated in said annular recess (LO) and said second abutment surface (SB2) rests against said third abutment surface (SB3) so as radially to tighten, in a sealed manner by forming a first radial and sealing interference contact, one of said first inner (SI1) and outer (SE1) surfaces of the first lip (L1) against said second outer surface (SE2) or said third inner surface (SI3) respectively, and

– in subjecting said expandable tubular joint, by means of an axially displaceable expansion tool, to a diametral expansion in the plastic deformation region, so as to force said first outer surface (SE1) and said third inner surface (SI3) locally to define a second sealing interference contact.

37. Method according to claim 36, characterised in that first (L1) and second (L2) lips having shapes selected such that said first interference contact is established between said first

inner surface (SI1) and second outer surface (SE2) are taken as a starting point and in that said first interference contact is not established until said second abutment surface (SB2) rests on said third abutment surface (SB3).

38. Method according to claim 37, characterised in that said screwing firstly forces said first abutment surface (SB1) to be pressed against said fourth abutment surface (SB4) so as to cause said first lip (L1) to be subjected to axial compression in the elastic deformation region.

39. Method according to claim 36, characterised in that an expandable tubular joint according to claim 28 is taken as a starting point and in that said screwing forces said first (DC3) and second (DC4) sealing forces to be radially tightened against one another, generating first the third sealing interference contact then the first sealing interference contact, which comes to reinforce said third sealing interference contact.

40. Method according to any one of claims 36 to 39, characterised in that said expansion generates a fourth sealing interference contact between a free end of the first inner surface (SI1) and the second outer surface (SE2).

41. Method according to any one of claims 36 to 40, characterised in that the radial expansion of the joint takes place at an expansion rate at least equal to 10%.